Mathematics Toolkit: Grade 5 Objective 5.B.1.a

Standard 5.0 Knowledge of Probability

Topic B. Theoretical Probability

Indicator 1. Determine the probability of one simple event comprised of equally likely outcomes

Objective a. Make predictions and express the probability as a fraction

Assessment Limits:

Use a sample space of no more than 20 outcomes

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Clarification

Mathematics Grade 5 Objective 5.B.1.a Assessment Limit 1

Probability is the chance or likelihood of an event occurring. Theoretical probability determines the chance of an event occurring based on the ratio of the favorable outcomes to the total number of outcomes. When drawing playing cards from a deck that contains only hearts, there are 13 possible cards that can be drawn. An event is a specific set of outcomes, such as *drawing a face card*.

A favorable outcome is one of the possible outcomes and is part of the event for which we want to find the probability. *Drawing a king* is a favorable outcome in the set of outcomes *drawing a face card*.

Classroom Example 1

When drawing cards from a deck that contains only hearts, there are 13 possible outcomes. The probability of drawing a face card (King, Queen or Jack) is 3 out of 13 or there is a $\frac{3}{13}$ chance that you will get a face card when you draw a card from this deck.

$$P = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} = \frac{3}{13}$$

What is the probability of drawing a card less than a 6, if an ace is the highest card? $\frac{4}{13}$

Classroom Example 2

A bag contains 12 marbles (4 red, 4 blue, 4 green).

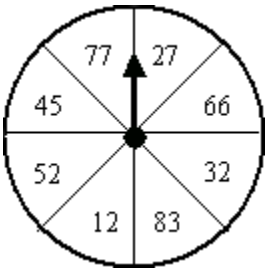
- What is the probability of picking a red marble? $\frac{4}{12}$
- What is the probability of picking a red marble or a blue marble? $\frac{8}{12}$

Clarification about the assessment limit:
The difference between 4^{th} and 5^{th} grade is the assessment limit. Fourth grade has an assessment limit of 6 outcomes such as rolling a die or using a spinner with 6 equal-sized spaces. 5^{th} grade has an assessment limit of 20 outcomes, which allows considerable problem extension. For example, activities can include picking a marble from a bag of 20 marbles or using one suit from a deck of cards and choosing a specific card.

Sample Item #1 - Selected Response (SR) Item

Mathematics Grade 5 Objective 5.B.1.a

Harry is using the spinner below.



Harry spins the arrow. What is the probability that the arrow will land on a number greater than 50?

A. $\frac{1}{8}$

B. $\frac{1}{6}$

C. $\frac{1}{4}$

D. $\frac{1}{2}$

Correct Answer:
D

Sample Item #2 - Selected Response (SR) Item

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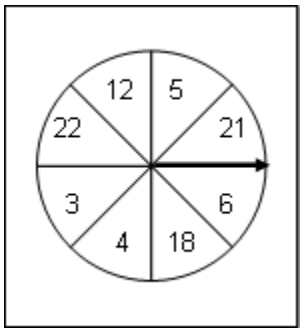
Look at the spinner.



Jack spins the arrow. What is the probability that the arrow will land on an odd number?

A. $\frac{3}{8}$
B. $\frac{4}{8}$
C. $\frac{5}{8}$
D. $\frac{6}{8}$

Correct Answer:
A

Sample Item #3 - Brief Constructed Response (BCR) Item

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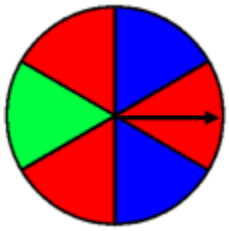
Jack and Bob are using the spinner to play a game. The spinner is divided into equal parts. Each boy chooses a color. When the arrow lands on the chosen color, that boy gets a point. Jack chooses blue. Bob chooses red.



Step A

Predict who the winner is.

Step B

Explain why your answer is correct.
Use what you know about probability in your explanation.
Use words, numbers, and/or symbols in your explanation.

Correct Answer:
Step A
Bob

Answer Annotation

Sample correct response: Bob chose red. There are 3 red parts. The spinner is divided into 6 equal parts. The probability that the spinner will land on red is $\frac{3}{6}$. Jack chose blue. There are 2 blue parts. The spinner is divided into 6 equal parts. The probability that the spinner will land on blue is $\frac{2}{6}$. $\frac{3}{6} > \frac{2}{6}$. Bob is the winner.

Rubric - Brief Constructed Response (BCR)

Score 2
The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation[1] of and/or justification[2] for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate. [3]

Score 1
The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation[1] of and/or justification[2] for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.[3]

Score 0
The response is completely incorrect, irrelevant to the problem, or missing.[4]

Notes:

[1] Explanation refers to students' ability to communicate how they arrived at the solution for an item using the language of mathematics.

[2] Justification refers to students' ability to support the reasoning used to solve a problem, or to demonstrate why the solution is correct using mathematical concepts and principles.

[3] Students need to complete rubric criteria for *explanation, justification, connections* and/or *extensions* as cued for in a given problem.

[4] Merely an exact copy or paraphrase of the problem will receive a score of "0".

Rubric Document Date: August 2003